

TOSHIBA Field Effect Transistor Silicon N-Channel MOS Type (U-MOS III)

TPCP8203

Portable Equipment Applications

Motor Drive Applications

DC/DC Converters

- Lead (Pb)-free
- Small footprint due to small and thin package
- Low drain-source ON-resistance: $R_{DS(ON)} = 31 \text{ m}\Omega$ (typ.)
- High forward transfer admittance: $|Y_{fs}| = 8.6 \text{ S}$ (typ.)
- Low leakage current: $I_{DSS} = 10 \text{ }\mu\text{A}$ (max) ($V_{DS} = 40 \text{ V}$)
- Enhancement model: $V_{th} = 1.3 \text{ to } 2.5 \text{ V}$
($V_{DS} = 10 \text{ V}$, $I_D = 1 \text{ mA}$)

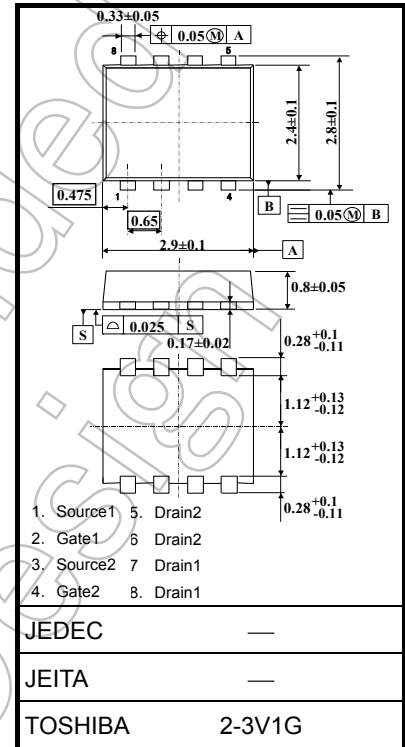
Absolute Maximum Ratings ($T_a = 25^\circ\text{C}$)

| Characteristic | | Symbol | Rating | Unit |
|---|---|-----------|------------|------------------|
| Drain-source voltage | | V_{DSS} | 40 | V |
| Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$) | | V_{DGR} | 40 | V |
| Gate-source voltage | | V_{GSS} | ± 20 | V |
| Drain current | DC (Note 1) | I_D | 4.7 | A |
| | Pulse (Note 1) | I_{DP} | 18.8 | |
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2a) | Single-device operation (Note 3a) | P_D (1) | 1.48 | W |
| | Single-device value at dual operation (Note 3b) | P_D (2) | 1.23 | |
| Drain power dissipation ($t = 5 \text{ s}$) (Note 2b) | Single-device operation (Note 3a) | P_D (1) | 0.58 | |
| | Single-device value at dual operation (Note 3b) | P_D (2) | 0.36 | |
| Single-pulse avalanche energy (Note 4) | | E_{AS} | 10.6 | mJ |
| Avalanche current | | I_{AR} | 4.7 | A |
| Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5) | | E_{AR} | 0.12 | mJ |
| Channel temperature | | T_{ch} | 150 | $^\circ\text{C}$ |
| Storage temperature range | | T_{stg} | -55 to 150 | $^\circ\text{C}$ |

Note: For Notes 1 to 6, see the next page.

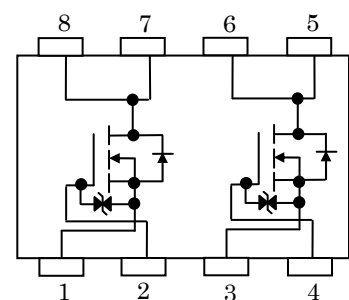
This transistor is an electrostatic-sensitive device. Handle with care.

Unit: mm

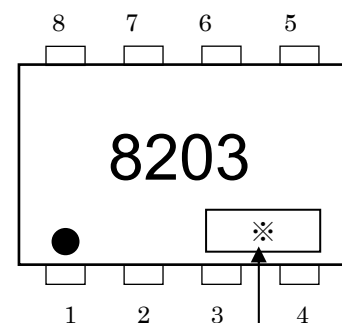


Weight: 0.017 g (typ.)

Circuit Configuration



Marking (Note 6)



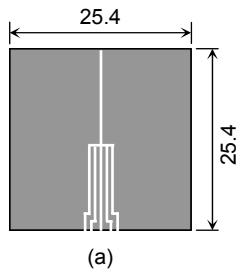
Lot No.

Thermal Characteristics

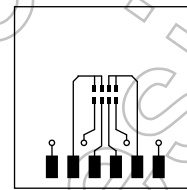
| Characteristic | | Symbol | Max | Unit |
|--|---|----------------------------|-------|------|
| Thermal resistance, channel to ambient (t = 5 s) (Note 2a) | Single-device operation (Note 3a) | R _{th (ch-a)} (1) | 84.5 | °C/W |
| | Single-device value at dual operation (Note 3b) | R _{th (ch-a)} (2) | 101.6 | |
| Thermal resistance, channel to ambient (t = 5 s) (Note 2b) | Single-device operation (Note 3a) | R _{th (ch-a)} (1) | 215.5 | °C/W |
| | Single-device value at dual operation (Note 3b) | R _{th (ch-a)} (2) | 347.2 | |

Note 1: Ensure that the channel temperature does not exceed 150°C.

Note 2: (a) Device mounted on a glass-epoxy board (a) (b) Device mounted on a glass-epoxy board (b)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)



FR-4
25.4 × 25.4 × 0.8
(Unit: mm)

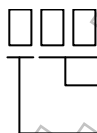
Note 3: a) The power dissipation and thermal resistance values shown are for a single device. (During single-device operation, power is applied to one device only.)
b) The power dissipation and thermal resistance values shown are for a single device. (During dual operation, power is applied to both devices evenly.)

Note 4: V_{DD} = 25 V, T_{ch} = 25°C (initial), L = 0.5 mH, R_G = 25 Ω, I_{AR} = 4.7 A

Note 5: Repetitive rating: Pulse width limited by Max. Channel temperature.

Note 6: ● on the lower left of the marking indicates Pin 1.

* Weekly code (3 digits):



Week of manufacture
(01 for the first week of the year, continuing up to 52 or 53)
Year of manufacture
(The last digit of the calendar year)

Note 7: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

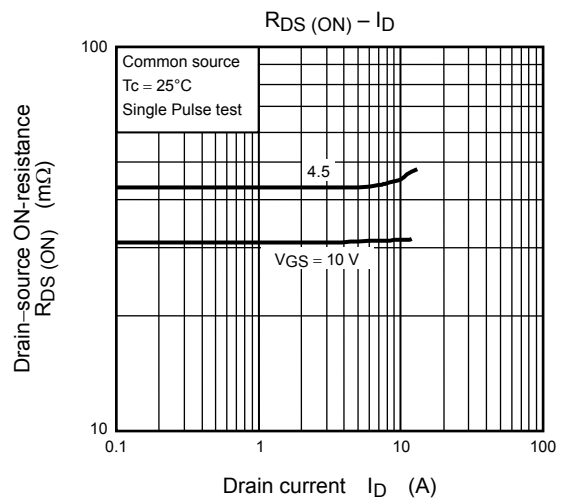
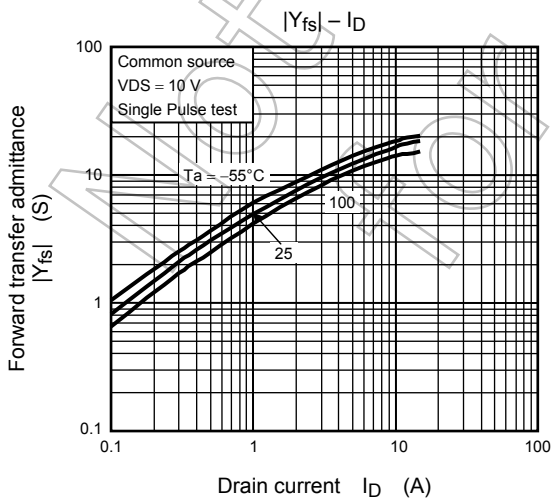
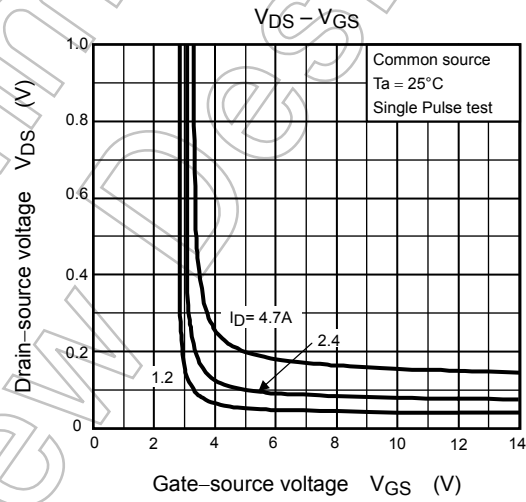
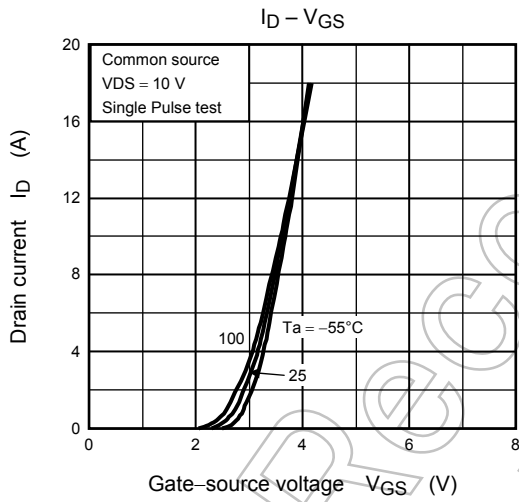
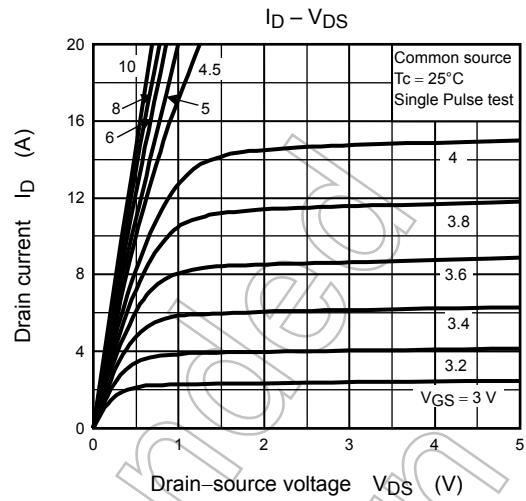
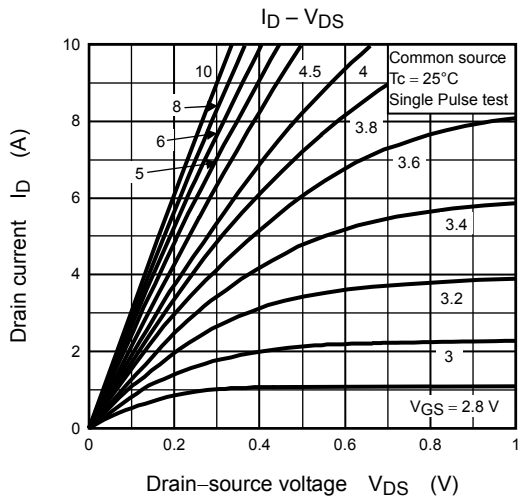
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/Derating Concept and Methods) and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

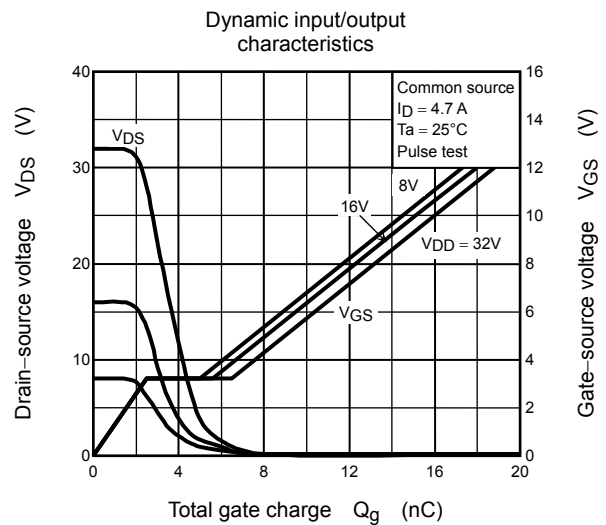
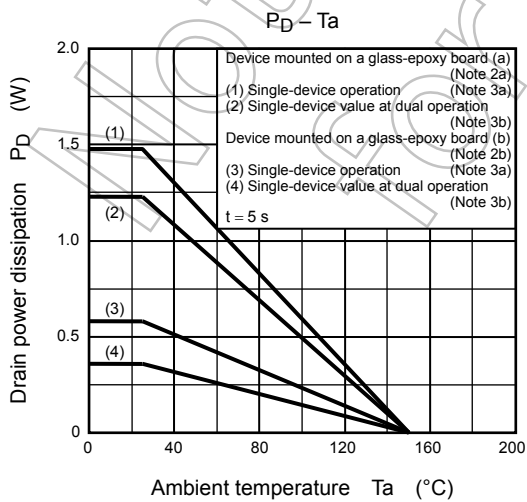
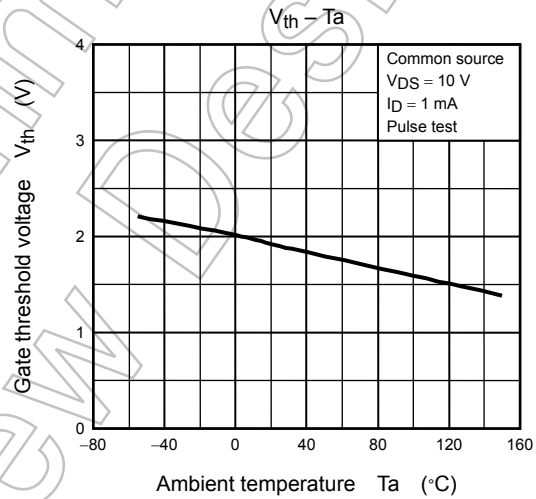
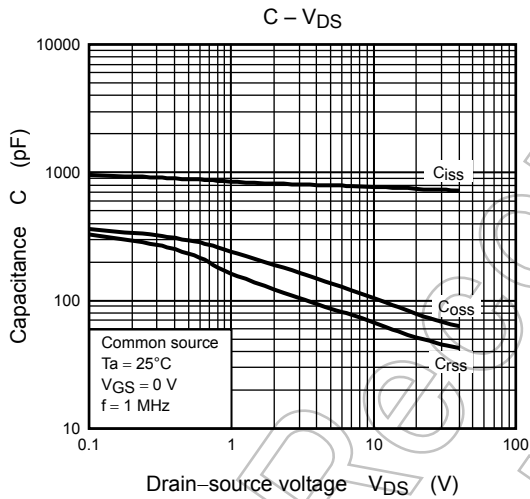
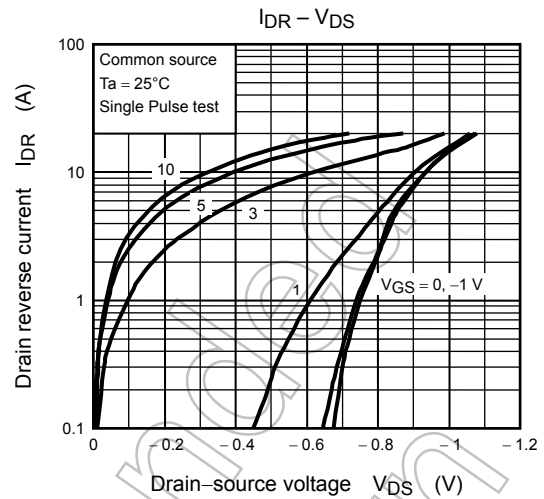
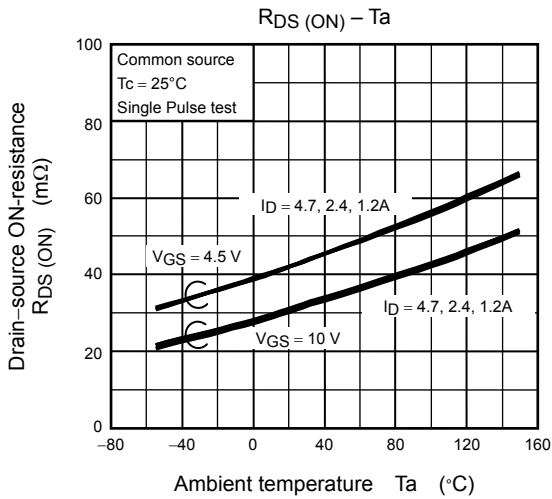
Electrical Characteristics (Ta = 25°C)

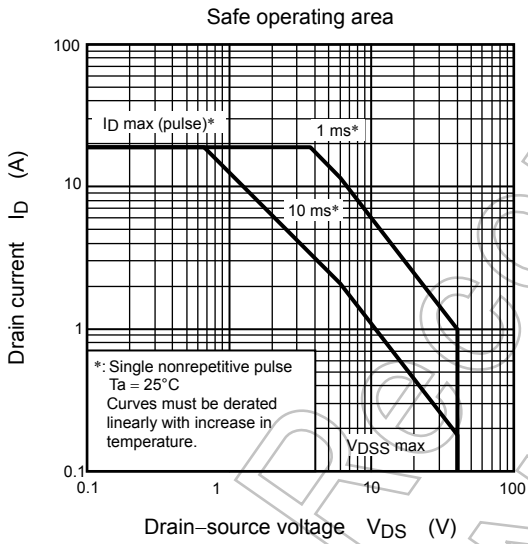
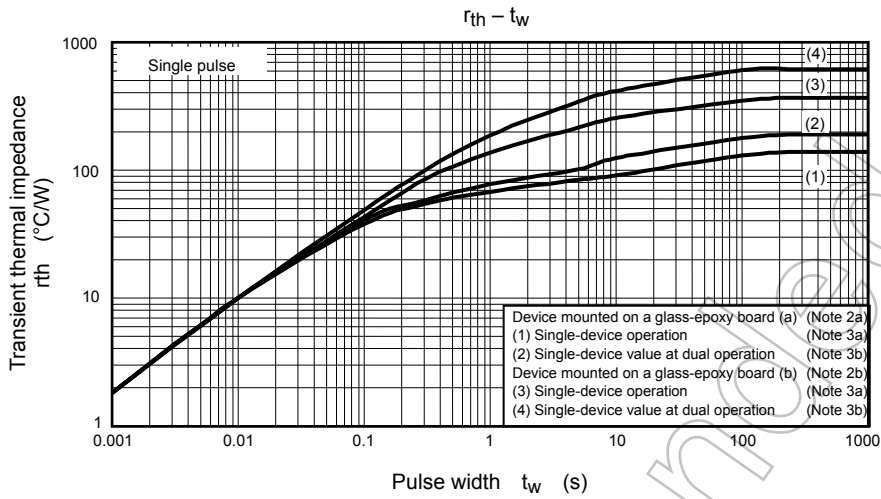
| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|---|---------------|---------------|--|---|------|----------|---------------|
| Gate leakage current | | I_{GSS} | $V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$ | — | — | ± 10 | μA |
| Drain cutoff current | | I_{DSS} | $V_{DS} = 40\text{ V}, V_{GS} = 0\text{ V}$ | — | — | 10 | μA |
| Drain-source breakdown voltage | | $V_{(BR)DSS}$ | $I_D = 10\text{ mA}, V_{GS} = 0\text{ V}$ | 40 | — | — | V |
| | | $V_{(BR)DSX}$ | $I_D = 10\text{ mA}, V_{GS} = -20\text{ V}$ | 15 | — | — | |
| Gate threshold voltage | | V_{th} | $V_{DS} = 10\text{ V}, I_D = 1\text{ mA}$ | 1.3 | — | 2.5 | V |
| Drain-source ON-resistance | | $R_{DS(ON)}$ | $V_{GS} = 4.5\text{ V}, I_D = 2.4\text{ A}$ | — | 43 | 60 | m Ω |
| | | $R_{DS(ON)}$ | $V_{GS} = 10\text{ V}, I_D = 2.4\text{ A}$ | — | 31 | 40 | |
| Forward transfer admittance | | $ Y_{fs} $ | $V_{DS} = 10\text{ V}, I_D = 2.4\text{ A}$ | 4.3 | 8.6 | — | S |
| Input capacitance | | C_{iss} | $V_{DS} = 10\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ | — | 770 | — | pF |
| Reverse transfer capacitance | | C_{rss} | | — | 70 | — | |
| Output capacitance | | C_{oss} | | — | 105 | — | |
| Switching time | Rise time | t_r | | — | 8 | — | ns |
| | Turn-on time | t_{on} | | — | 15 | — | |
| | Fall time | t_f | | — | 9 | — | |
| | Turn-off time | t_{off} | | Duty $\leq 1\%$, $t_w = 10\ \mu\text{s}$ | — | 70 | |
| Total gate charge (gate-source plus gate-drain) | | Q_g | $V_{DD} \approx 32\text{ V}, V_{GS} = 10\text{ V}, I_D = 4.7\text{ A}$ | — | 16 | — | nC |
| Gate-source charge1 | | Q_{gs1} | | — | 2.5 | — | |
| Gate-drain ("Miller") charge | | Q_{gd} | | — | 4 | — | |

Source-Drain Ratings and Characteristics (Ta = 25°C)

| Characteristic | | Symbol | Test Condition | Min | Typ. | Max | Unit |
|-------------------------|----------------|-----------|--|-----|------|------|------|
| Drain reverse current | Pulse (Note 1) | I_{DRP} | — | — | — | 18.8 | A |
| Forward voltage (diode) | | V_{DSF} | $I_{DR} = 4.7\text{ A}, V_{GS} = 0\text{ V}$ | — | — | -1.2 | V |







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